L5: Entry 29 of 39 File: USPT Mar 23, 1999

DOCUMENT-IDENTIFIER: US 5887223 A
TITLE: Image forming apparatus having high image quality control mechanism

Abstract Text (1):
An unfixed toner image of a reference pattern is formed on a photosensitive member, the unfixed toner image is measured by a development density sensor 13, and the amount of toner to be supplied to a developing device 4 is controlled by a toner supply control unit 60 on the basis of a measurement output, thereby maintaining the image quality constant. If it is judged from a result of a detection of a state amount such as the temperature and the humidity by a state amount sensor 19 that there is a fear that the image quality exceeds an allowable range, a fixed image of a reference pattern is formed on a record medium such as a banner sheet, and the fixed image is measured by an optical sensor 10. Operation amounts such as the charge amount and the exposure value of an image output unit 100 are controlled by an image density control unit 20, thereby maintaining the image quality to be within the allowable range.

Brief Summary Text (3):
The invention relates to an image forming apparatus of the electrophotographic type, and particularly to an image forming apparatus of the electrophotographic type in which the image quality is controlled so as to be always held to a predetermined level.

Brief Summary Text (5):
Generally, it is known that the sensitivity of a human being to a color difference is very high. When the color difference .DELTA.E between images to be compared with each other is about 5 in an L*a*b* color space, for example, the images can be distinguished from each other irrespective of the observer and conditions. It is reported that, when .DELTA.E is about 3, many observers hardly distinguish a color difference (see D. H. Alman, R. S. Berns, G. D. Snyder, and W. A. Larsen, Performance Testing of Color-Difference Metrics Using a Color Tolerance Dataset, COLOR research and application, vol. 14, Number 3, June 1989).

Brief Summary Text (6):
From these facts, it will be seen that, when the target level of the image reproducibility is set to be within the color difference recognition limit of a human being, an image forming apparatus is required to produce a color difference as high as .DELTA.E=3 or less.

Brief Summary Text (7):
As well known in the art, however, a prior art image forming apparatus of the electrophotographic type cannot fulfil such a high requirement. This is caused by the following reason. In an apparatus of the electrophotographic type, an electrostatic phenomenon is used, and hence the image output state of the apparatus itself is changed in accordance with the conditions of the environment where the apparatus is placed, such as the temperature and the humidity, or by temporal deterioration of a photosensitive member, a developer, or the like, with the result that the image reproducibility is varied.

Brief Summary Text (8):

To comply with this, an image forming apparatus of the electrophotographic type usually employs a feedback control to maintain the image density to an optimum level. In a control method which is most usually used, specifically, the reproduction state of the density and the environmental conditions of the interior of the apparatus are monitored by using a density patch, an error with respect to the target density is obtained, and the error is multiplied by a feedback gain, thereby calculating a correction amount of a preset value of a control actuator.

Brief Summary Text (16):
Because of these reasons, in an image forming apparatus of the electrophotographic type, effects such as those of various environmental conditions, for example, a high temperature and humidity state or low temperature and humidity state, and those of temporal deterioration of a photosensitive member, a developer, or the like must be previously known. As an apparatus of a higher control performance is to be developed, data must be collected in detail over a wider range of conditions. Therefore, enormous development manhours are required.

Brief Summary Text (27):
According to a first aspect of the invention, an image forming apparatus comprises:

Brief Summary Text (36):
According a second aspect of the invention, an image forming apparatus comprises:

Brief Summary Text (45):
According to a third aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the toner image measuring means detects an amount of adhering toner of the unfixed toner image.

Brief Summary Text (46):
According to a fourth aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the toner image measuring means irradiates the unfixed toner image with infrared rays and detects a density of the unfixed toner image from a quantity of reflected light or a quantity of diffused light.

Brief Summary Text (47):
According to a fifth aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the fixed image measuring means detects a density of a single toner color on the record medium as the fixed image.

Brief Summary Text (48):
According to a sixth aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the fixed image measuring means detects a density of a single toner color among colors of yellow, magenta, cyan, and black on the record medium as the fixed image.

Brief Summary Text (49):
According to a seventh aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the fixed image measuring means detects a density of the fixed image while separating the fixed image into colors of red, green, and blue.

Brief Summary Text (50):
According to an eighth aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the fixed image measuring means irradiates the fixed image with light emitted from a light emitting diode and detects a density of the fixed image from a quantity of reflected light or a quantity of transmitted light.

Brief Summary Text (51):
According to a ninth aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the fixed image measuring means measures the fixed image as an image signal which is represented by an L*a*b* color space, an L*C*h color space, or an XYZ color space.

Brief Summary Text (52):
According to a tenth aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the state amount detecting means detects one of a temperature, humidity, a number of sheets output by the image forming means, and an operating time period of the image forming apparatus.

Brief Summary Text (53):
According to an eleventh aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the toner supply controlling means supplies toner into a developing device in accordance with a difference between a density of an unfixed toner image of an image area rate of 100% and a target value of the density.

Brief Summary Text (54):
According to a twelfth aspect of the invention, the image forming apparatus of the first or second aspect of the invention is configured so that the image quality controlling means comprises:

Brief Summary Text (59):
The first aspect of the invention is directed to a control system which is used in the case where the environment is not largely changed or where the image forming means is not largely affected by a change of the environment. In the image forming apparatus of the invention, usually, an unfixed toner image of the reference pattern is formed by the image forming means, the unfixed toner image is measured by the toner image measuring means, and the amount of supplied toner is controlled by the toner supply controlling means on the basis of the output of the toner image measuring means, thereby maintaining the image quality constant.

Brief Summary Text (63):
The second aspect of the invention is directed to a control system which is used in the case where the environment is expected to be changed at a certain degree or where the image forming means is easily affected by a change of the environment. In the image forming apparatus of the second aspect of the invention, usually, an unfixed toner image of the reference pattern is formed by the image forming means, the unfixed toner image is measured by the toner image measuring means, the amount of supplied toner is controlled by the toner supply controlling means on the basis of the output of the toner image measuring means, and an operation amount of the image forming means such as the charge amount or the exposure value is controlled by the image quality controlling means on the basis of the output of the toner image measuring means, thereby maintaining the image quality constant.

Drawing Description Text (3):
FIG. 1 is a view showing an image output unit and various control units of a first embodiment of the image forming apparatus of the invention;

Drawing Description Text (4):
FIG. 2 is a view showing a specific example of an image density control unit of the embodiment of FIG. 1;

Drawing Description Text (6):
FIG. 4 is a view showing an example of an image output unit of the image forming apparatus of the invention;

Drawing Description Text (15):
FIG. 13 is a view showing an image output unit and various control units of a second embodiment of the image forming apparatus of the invention;

Drawing Description Text (16):
FIG. 14 is a view showing a specific example of an image density control unit of the embodiment of FIG. 13; and

Detailed Description Text (4):
First, an example of the invention will be described as Embodiment 1. FIG. 1 shows an image output unit and various control units of an image forming apparatus of Embodiment 1, and FIG. 2 shows particularly a specific example of an image density control unit.

Detailed Description Text (7):
FIG. 4 schematically shows the image output unit of the image forming apparatus of Embodiment 1. In an image input unit which is not shown in the figure, an image of an original is read by a scanner to obtain input image data, or input image data which are prepared by an external computer are fetched into the apparatus. In an image process unit which also is not shown in the figure, necessary processing including color conversion and gray scale correction is conducted on the input image data from the image input unit and output image data which are to be output from the image output unit 100 are obtained.

Detailed Description Text (12):
The manual setup operation by the user can be selected through a mode changeover switch disposed in a user interface (not shown) of the image forming apparatus. When the manual setup mode is selected through the mode changeover switch, a banner sheet is output immediately before the output of a document which the user intends to output, and the apparatus is then set up.

Detailed Description Text (20):
The image output unit 100 shown in FIG. 4 is used in a monochrome image forming apparatus. In the case of a color image forming apparatus which forms an image by using color toners of yellow, magenta, cyan, and black, a reference pattern such as that shown in FIG. 5 or a combination of the solid density patch a1 and the highlight density patch a2 is formed for each of yellow, magenta, cyan, and black, and the optical sensor 10 is disposed for each of the colors.

Detailed Description Text (21):
In this case, as shown in FIG. 8, for example, the optical sensor which measures a yellow density patch Ya is configured by an LED 11B irradiating the density patch Ya with light of blue which is the complementary color of yellow, and a light receiving device 12Y which receives light reflected from the density patch Ya; the optical sensor which measures a magenta density patch Ma is configured by an LED 11G irradiating the density patch Ma with light of green which is the complementary color of magenta, and a light receiving device 12M which receives light reflected from the density patch Ma; and the optical sensor which measures a cyan density patch Ca is configured by an LED 11R irradiating the density patch Ca with light of red which is the complementary color of cyan, and a light receiving device 12C which receives light reflected from the density patch Ca and a light receiving device 12K receives light from a density patch Ka.

Detailed Description Text (34):
The image forming apparatus comprises a reference pattern generator 50 which generates a reference pattern signal for forming the reference pattern as a fixed image and the reference pattern as an unfixed toner image. As described later, the reference pattern generator 50 generates the reference pattern signal in response to instructions from a development density sensor sensitivity calibration control

unit 70 and an image density control unit 20, and supplies the signal to the image output unit 100.

Detailed Description Text (35):
(Toner supply control unit and the development density sensor sensitivity calibration control unit)

Detailed Description Text (36):
A toner supply control unit 60 drives the dispensing motor 18 on the basis of the output of the development density sensor 13, i.e., the measurement output of the unfixed toner image of the reference pattern, thereby controlling the amount of toner supplied to the developing device 4. The development density sensor sensitivity calibration control unit 70 calibrates the sensitivity of the development density sensor 13 on the basis of the outputs of the state amount sensor 19, the development density sensor 13, and the optical sensor 10. These units will be described in detail later.

Detailed Description Text (37):
(Image density control unit)

Detailed Description Text (38):
In Embodiment 1, the image density control unit 20 controls operation amounts of the image output unit 100, or, in the embodiment, the grid voltage of the scorotron charger 3 and the laser output power of the laser output unit 1, on the basis of the output of the optical sensor 10, i.e., the measurement output of the fixed image of the reference pattern, thereby controlling the quality of the output image. For example, the image density control unit is configured as shown in FIG. 2.

Detailed Description Text (39):
Through a density adjust dial 41 of the image density control unit 20, the user presets target densities for the solid density patch a1 and the highlight density patch a2. The set values of the target densities of the density adjust dial 41 are converted by a converter 42 into values corresponding to output values of the optical sensor 10. The converted output values are stored in a control amount target value memory 21. In the embodiment, the converted output values are in the range of 0 to 255. The control amount target value memory 21 stores also allowable error values.

Detailed Description Text (50):
A state amount comparator 47, a cluster memory 48, and a control rule calculator 23 of the image density control unit 20 shown in FIG. 2 have a function of extracting a control rule with referring the control cases stored in the control case memory 46.

Detailed Description Text (53):
In the control of the image density which is conducted by the image density control unit 20, at the timing when the reference pattern is formed during the output of a banner sheet, the reference pattern generator 50 supplies the signal of the reference pattern of the fixed image to the image output unit 100. As a result, the three combinations of the solid density patch a1 and the highlight density patch a2 are formed on the banner sheet B as shown in FIG. 5.

Detailed Description Text (54):
In this case, the operation timing of the reference pattern generator 50 is determined by an I/O adjust unit 28. During the banner sheet output, the I/O adjust unit 28 monitors a time signal output from the clock timer 29, and supplies an operation timing signal to the reference pattern generator 50 so that the solid density patch a1 and the highlight density patch a2 are formed at predetermined positions on the banner sheet B. The image density control unit 20 may be

configured in any manner as far as it has the above-mentioned functions. For example, the unit may have the configuration disclosed in the specification of U.S. Pat. No. 5,682,573 issued on Oct. 28, 1997.

Detailed Description Text (57):
The development density sensor 13 detects the amount of adhering toner per unit area of the unfixed toner image of the solid density patch c1 and the highlight density patch c2. The toner supply control unit 60 compares the detected value with the target value stored in the memory of the toner supply control unit 60. In accordance with the comparison result, toner is suppled to the developing device 4.

Detailed Description Text (58):
Specifically, the dispensing motor 18 is driven for a time period which is proportional to the difference between the measured density value of the solid density patch c1 and the target value of the solid density, so that toner of an amount proportional to the difference is suppled to the developing device 4. The proportional constant of the driving time period of the dispensing motor 18 with respect to the difference between the measured value of the solid density and the target value is previously determined from prior experiments.

Detailed Description Text (60):
The sensitivity of the development density sensor 13 is calibrated by the development density sensor sensitivity calibration control unit 70 in response to instructions from a user interface (not shown) in the case such as that where the user or the engineer judges that such calibration is necessary or that where a part relating to the image formation is replaced with another one.

Detailed Description Text (61):
In the development density sensor sensitivity calibration control unit 70, the output of the state amount sensor 19, i.e., the temperature, the humidity, the number of sheets which are output after the previous calibration, and the operating time period elapsed after the previous calibration are compared with thresholds of the state amounts which are previously stored in the memory of the development density sensor sensitivity calibration control unit 70, respectively. If it is judged that the sensitivity of the development density sensor 13 must be calibrated, the development density sensor sensitivity calibration control unit 70 automatically conducts the sensitivity calibration on the development density sensor 13. In this case, the necessity of the sensitivity calibration may be judged on the basis of comparisons which are separately conducted on the respective state amounts, or combinations of the state amounts.

Detailed Description Text (62):
When the calibration of the sensitivity of the development density sensor 13 is conducted in response to instructions input through the user interface or a judgement of the development density sensor sensitivity calibration control unit 70, the development density sensor sensitivity calibration control unit 70 first instructs the reference pattern generator 50 to supply a signal of the reference pattern to the image output unit 100. Then, an unfixed toner image of the solid density patch c1 and the highlight density patch c2 such as that shown in FIG. 10 is formed in the image area 2a of the photosensitive member 2.

Detailed Description Text (63):
The unfixed toner image of the solid density patch c1 and the highlight density patch c2 is measured by the development density sensor 13. The measured value is written into the memory of the development density sensor sensitivity calibration control unit 70.

Detailed Description Text (65):
The fixed image of the solid density patch c1 and the highlight density patch c2 is

measured by the optical sensor 10. The measured value is written into the memory of the development density sensor sensitivity calibration control unit 70.

Detailed Description Text (66):
In the development density sensor sensitivity calibration control unit 70, relationships among differences between the value of a fixed image measured by the optical sensor 10 and that of an unfixed toner image measured by the development density sensor 13, and coefficients for sensitivity calibration are previously written in the form of a LUT (Look-Up Table). The development density sensor sensitivity calibration control unit 70 obtains the difference between the value of the fixed image measured by the optical sensor 10 and that of the unfixed toner image measured by the development density sensor 13. A retrieval operation based on the difference is conducted on the LUT and a coefficient for sensitivity calibration is read. Also in this case, practically, only the solid density is used.

Detailed Description Text (67):
The read coefficient for sensitivity calibration is supplied to the toner supply control unit 60. In the toner supply control described above, the coefficient is multiplied with the proportional constant of the driving time period of the dispensing motor 18 with respect to the difference between the measured value of the solid density and the target value, in order that the sensitivity change of the development density sensor 13 is canceled.

Detailed Description Text (69):
According to Embodiment 1 described above, usually, the amount of supplied toner is controlled by the toner supply control unit 60 on the basis of an unfixed toner image of the reference pattern, thereby maintaining the image quality constant. Therefore, it is not required to output a test sheet frequently or at each time when the image management routine is to be conducted. As a result, the image quality can be controlled at high accuracy without causing the running cost to be increased and the original productivity of the image formation of the apparatus to be lowered.

Detailed Description Text (75):
In the above, the embodiment applied to a monochrome image forming apparatus has been described. Embodiment 1 may be applied also to a multicolor image forming apparatus in the strictly same manner, with attaining the same effects. The embodiment may be applied also to an analog copier.

Detailed Description Text (78):
Next, an example of the invention set forth in claim 2 will be described as Embodiment 2. FIG. 13 shows an image output unit and various control units of an image forming apparatus of Embodiment 2, and FIG. 14 shows particularly a specific example of an image density control unit.

Detailed Description Text (81):
The image output unit 100 of the image forming apparatus of Embodiment 2 is identical with that of Embodiment 1, and configured as shown in, for example, FIG. 4.

Detailed Description Text (87):
(Toner supply control unit and the development density sensor sensitivity calibration control unit)

Detailed Description Text (88):
Also the toner supply control unit 60 and the development density sensor sensitivity calibration control unit 70 are identical with those of Embodiment 1. These units will be described in detail later.

Detailed Description Text (89):
(Image density control unit)

Detailed Description Text (90):
In Embodiment 2, the image density control unit 20 controls operation amounts of the image output unit 100, or, in the embodiment, the grid voltage of the scorotron charger 3 and the laser output power of the laser output unit 1, on the basis of the output of the development density sensor 13, i.e., the measurement output of the unfixed toner image of the reference pattern, thereby controlling the quality of the output image. Therefore, the embodiment is configured in the same manner as Embodiment 1 except that the formation and measurement of the reference pattern of a fixed image on the banner sheet B in Embodiment 1 are replaced with those of the reference pattern of an unfixed toner image on the photosensitive member 2.

Detailed Description Text (91):
Control cases such as those listed in the table of FIG. 15 are stored in the control case memory 46 of the image density control unit 20. The control cases are different from those of Embodiment 1 only in that the output value of the optical sensor 10 shown in FIG. 3 is replaced with that of the development density sensor 13.

Detailed Description Text (93):
(Operation of initializing the image density control unit)

Detailed Description Text (94):
Also in the image forming apparatus of Embodiment 2, as an initializing process or a so-called function start up process, the engineer suitably sets the scorotron set value and the LP set value of the control parameters. The image density control unit 20 forms the solid density patch c1 and the highlight density patch c2 on the photosensitive member 2. Each of the patches is measured by the development density sensor 13, and the measurement result is stored as a control case in the control case memory 46. As a result, a first control case is stored in the control case memory 46.

Detailed Description Text (98):
(Basic operation of the image density control unit during a working period)

Detailed Description Text (99):
Regarding a working period of the image forming apparatus, hereinafter, a case where a control rule of initial setting is determined as described above and a control for a real work is started on the next day is supposed.

Detailed Description Text (100):
When the image forming apparatus is powered on, a set up operation is automatically executed. In the set up operation, the solid density patch c1 and the highlight density patch c2 are formed on the photosensitive member 2 while using the previous set values, for example, the set values of the final image output of the previous day as the present set values, and then measured by the development density sensor 13. The measured values are plotted in the control case space.

Detailed Description Text (110):
The sensitivity of the development density sensor 13 is calibrated by the development density sensor sensitivity calibration control unit 70 in response to instructions from a user interface (not shown) in the case such as that where the user or the engineer judges that such calibration is necessary or that where a part relating to the image formation is replaced with another one.

Detailed Description Text (111):
In the development density sensor sensitivity calibration control unit 70, the output of the state amount sensor 19, i.e., the temperature, the humidity, the

number of sheets which are output after the previous calibration, and the operating time period elapsed after the previous calibration are compared with thresholds of the state amounts which are previously stored in the memory of the development density sensor sensitivity calibration control unit 70, respectively. If it is judged that the sensitivity of the development density sensor 13 must be calibrated, the development density sensor sensitivity calibration control unit 70 automatically conducts the sensitivity calibration on the development density sensor 13. In this case, the necessity of the sensitivity calibration may be judged on the basis of comparisons which are separately conducted on the respective state amounts, or combinations of the state amounts.

Detailed Description Text (112):
When the calibration of the sensitivity of the development density sensor 13 is conducted in response to instructions input through the user interface or a judgement of the development density sensor sensitivity calibration control unit 70, the development density sensor sensitivity calibration control unit 70 first instructs the reference pattern generator 50 to supply a signal of the reference pattern to the image output unit 100. Then, an unfixed toner image of the solid density patch c1 and the highlight density patch c2 such as that shown in FIG. 10 is formed in the image area 2a of the photosensitive member 2.

Detailed Description Text (113):
The unfixed toner image of the solid density patch c1 and the highlight density patch c2 is measured by the development density sensor 13. The measured value is written into the memory of the development density sensor sensitivity calibration control unit 70.

Detailed Description Text (115):
The fixed image of the solid density patch c1 and the highlight density patch c2 is measured by the optical sensor 10. The measured value is written into the memory of the development density sensor sensitivity calibration control unit 70.

Detailed Description Text (116):
In the development density sensor sensitivity calibration control unit 70, relationships among differences between the value of a fixed image measured by the optical sensor 10 and that of an unfixed toner image measured by the development density sensor 13, and coefficients for sensitivity calibration are previously written in the form of a LUT (Look-Up Table). The development density sensor sensitivity calibration control unit 70 obtains the difference between the value of the fixed image measured by the optical sensor 10 and that of the unfixed toner image measured by the development density sensor 13. A retrieval operation based on the difference is conducted on the LUT and a coefficient for sensitivity calibration is read. Also in this case, practically, only the solid density is used.

Detailed Description Text (117):
The read coefficient for sensitivity calibration is supplied to the toner supply control unit 60. In the toner supply control described above, the coefficient is multiplied with the proportional constant of the driving time period of the dispensing motor 18 with respect to the difference between the measured value of the solid density and the target value, in order that the sensitivity change of the development density sensor 13 is canceled.

Detailed Description Text (119):
According to Embodiment 2 described above, usually, the amount of supplied toner is controlled by the toner supply control unit 60 on the basis of an unfixed toner image of the reference pattern, and the operation amount of the image output unit 100 is controlled by the image density control unit 20, thereby maintaining the image quality constant. Therefore, it is not required to output a test sheet frequently or at each time when the image management routine is to be conducted. As

a result, the image quality can be controlled at high accuracy without causing the running cost to be increased and the original productivity of the image formation of the apparatus to be lowered.

Other Reference Publication (1):
Color Research and Application, vol. 14, No. 3, Jun. 1989, "Performance Testing of Color-Difference Metrics Using a Color Tolerance Dataset", David H. Alman et al., pp. 139-151.

CLAIMS:

1. An image forming apparatus, comprising:

image forming means of an electrophotographic type;

toner image measuring means for measuring an unfixed toner image of a reference pattern, the unfixed toner image being formed by said image forming means;

toner supply controlling means for controlling an amount of supplied toner on the basis of an output of said toner image measuring means;

state amount detecting means for detecting a state amount relating to an image formation;

image formation controlling means for causing said image forming means to form a fixed image of the reference pattern on a record medium, on the basis of a detection result of said state amount detecting means;

fixed image measuring means for measuring the fixed image of the reference pattern, the fixed image being formed by said image forming means;

image quality controlling means for controlling a quality of an output image on the basis of an output of said fixed image measuring means; and

sensitivity calibrating means for calibrating a sensitivity of said toner image measuring means on the basis of the output of said fixed image measuring means.

2. An image forming apparatus according to claim 1, wherein

said toner image measuring means detects an amount of adhering toner of the unfixed toner image.

3. An image forming apparatus according to claim 1, wherein said toner image measuring means irradiates the unfixed toner image with infrared rays and detects a density of the unfixed toner image from a quantity of reflected light or a quantity of diffused light.

4. An image forming apparatus according to claim 1, wherein said fixed image measuring means detects a density of a single toner color on the record medium as the fixed image.

5. An image forming apparatus according to claim 1, wherein said fixed image measuring means detects a density of a single toner color among colors of yellow, magenta, cyan, and black on the record medium as the fixed image.

6. An image forming apparatus according to claim 1, wherein said fixed image measuring means detects a density of the fixed image while separating the fixed image into colors of red, green, and blue.

7. An image forming apparatus according to claim 1, wherein said fixed image

measuring means irradiates the fixed image with light emitted from a light emitting diode and detects a density of the fixed image from a quantity of reflected light or a quantity of transmitted light.

8. An image forming apparatus according to claim 1, wherein said fixed image measuring means measures the fixed image and outputs an image signal in an L*a*b* color space, an L*C*h color space, or an XYZ color space.

9. An image forming apparatus according to claim 1, wherein said state amount detecting means detects one of a temperature, humidity, a number of sheets output by said image forming means, and an operating time period of said image forming apparatus.

10. An image forming apparatus according to claim 1, wherein said toner supply controlling means supplies toner into a developing device in accordance with a difference between a density of an unfixed toner image of an image area rate of 100% and a target value of the density.

11. An image forming apparatus according to claim 1, wherein said image quality controlling means comprises:

image quality changing means for changing the quality of the output image in accordance with an operation amount;

control case storing means for storing control cases of the output image;

control rule extracting means for extracting a control rule from the plural control cases stored in said control case storing means; and

operation amount calculating means for, by using the control rule extracted by said control rule extracting means, calculating a new operation amount so that the quality of the output image coincides with the target quality, and supplying the new calculated operation amount to said image quality changing means.

12. An image forming apparatus, comprising:

image forming means of an electrophotographic type;

toner image measuring means for measuring an unfixed toner image of a reference pattern, the unfixed toner image being formed by said image forming means;

toner supply controlling means for controlling an amount of supplied toner on the basis of an output of said toner image measuring means;

image quality controlling means for controlling a quality of an output image on the basis of an output of said toner image measuring means;

state amount detecting means for detecting a state amount relating to an image formation;

image formation controlling means for causing said image forming means to form a fixed image of the reference pattern on a record medium, on the basis of a detection result of said state amount detecting means;

fixed image measuring means for measuring the fixed image of the reference pattern, the fixed image being formed by said image forming means; and

sensitivity calibrating means for calibrating a sensitivity of said toner image measuring means on the basis of an output of said fixed image measuring means.

13. An image forming apparatus according to claim 12, wherein said fixed image measuring means measures the fixed image and an outputs image signal in an L*a*b color space, an L*C*h color space, or an XYZ color space.

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Relevance Rank: 65

L11: Entry 1 of 1 File: DWPI Jul 14, 2003

DERWENT-ACC-NO: 2000-471201
DERWENT-WEEK: 200347

TITLE: Image forming apparatus for forming color image on paper, has control unit which regulates position of image transfer unit opposite to conveyed paper

INVENTOR: IMADO, S; IWASAKI, R ; KOJIMA, T ; NAKAYASU, H

PATENT-ASSIGNEE: FUJITSU LTD (FUIT)

PRIORITY-DATA: 1998JP-0361680 (December 18, 1998)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 3426148 B2	July 14, 2003		019	G03G015/01
JP 2000181186 A	June 30, 2000		019	G03G015/01
DE 19960067 A1	July 20, 2000		000	G03G015/01
US 6219496 B1	April 17, 2001		000	G03G015/01

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP 3426148B2	December 18, 1998	1998JP-0361680	
JP 3426148B2		JP2000181186	Previous Publ.
JP2000181186A	December 18, 1998	1998JP-0361680	
DE 19960067A1	December 13, 1999	1999DE-1060067	
US 6219496B1	December 16, 1999	1999US-0464450	

INT-CL (IPC): G03 G 15/01; G03 G 15/16; G03 G 21/14

RELATED-ACC-NO: 2003-272516

ABSTRACTED-PUB-NO: JP2000181186A
BASIC-ABSTRACT:

NOVELTY - A control unit (3) regulates the position of an image transfer unit (20) opposite a paper conveyed by a conveying belt. A timer (1) measures the driving

time of the apparatus based on the time measured with the image transfer unit which transfer the image for every fundamental color to the paper on the conveying belt.

DETAILED DESCRIPTION - The image transfer unit is arranged in the conveying direction of the paper to form the color image for every fundamental color to the conveyed paper.

USE - For forming color image on paper.

ADVANTAGE - Forms color image without color gap and without causing throughput reduction by performing prospective correction since conveying belt velocity is stabilized.

DESCRIPTION OF DRAWING(S) - The figure shows the block diagram of the image forming apparatus.

Timer 1

Control unit 3

Image transfer unit 20

ABSTRACTED-PUB-NO: US 6219496B
EQUIVALENT-ABSTRACTS:

NOVELTY - A control unit (3) regulates the position of an image transfer unit (20) opposite a paper conveyed by a conveying belt. A timer (1) measures the driving time of the apparatus based on the time measured with the image transfer unit which transfer the image for every fundamental color to the paper on the conveying belt.

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USE - For forming color image on paper.

ADVANTAGE - Forms color image without color gap and without causing throughput reduction by performing prospective correction since conveying belt velocity is stabilized.

DESCRIPTION OF DRAWING(S) - The figure shows the block diagram of the image forming apparatus.

Timer 1

Control unit 3

Image transfer unit 20

CHOSEN-DRAWING: Dwg.2/21

DERWENT-CLASS: P84 S06
EPI-CODES: S06-A05; S06-A11; S06-A14C;

6209496

L5: Entry 39 of 39 File: DWPI Jul 14, 2003

DERWENT-ACC-NO: 2000-471201
DERWENT-WEEK: 200347

TITLE: Image forming apparatus for forming color image on paper, has control unit which regulates position of image transfer unit opposite to conveyed paper

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Standard Title Terms (1):
IMAGE FORMING APPARATUS FORMING COLOUR IMAGE PAPER CONTROL UNIT REGULATE POSITION IMAGE TRANSFER UNIT OPPOSED CONVEY PAPER

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? d s
Set Items Description
S1 290250 S IMAG?()FORM?
S2 1470222 S CARRIER?
S3 988772 S DEVELOP?(3N)(DEVICE? OR UNIT? OR SYSTEM?)
S4 206093 S DEVELOPER? Or TONER?
S5 28511610 S CONSUM????? OR USE OR USED OR USES OR EXPENDITUR???? OR UTILI?????
S6 9687798 S DETECT? OR SENS?????
S7 3563767 S BOND?????? OR ADHERE OR ADHERES OR ADHERED OR ADHERING OR STICK? OR GLU????
S8 6853 S S1 AND S2 AND S3
S9 19049 S S4 AND S5 AND S6
S10 15067 S S7(3N)(S3 OR S4 OR S2)
S11 1449 S S10 AND S1
S12 11490 S S7(2N)(S3 OR S4 OR S2)
S13 1151 S S12 AND S1
S14 517677 S S6(3N)S5
S15 12 S S13 AND S14
S16 12 RD (unique items)
S17 19 S S14 AND S11
S18 7 S S17 NOT S16
S19 7 RD (unique items)

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[File 36] **MetalBase** 1965-20050929

[File 65] **Inside Conferences** 1993-2005/Sep W4

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[File 46] **Corrosion Abstracts** 1966-2005/Sep

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[File 953] **Ei EnCompassPat(TM)** 1964-200539

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L5: Entry 39 of 39 File: DWPI Jul 14, 2003

DERWENT-ACC-NO: 2000-471201
DERWENT-WEEK: 200347

TITLE: Image forming apparatus for forming color image on paper, has control unit which regulates position of image transfer unit opposite to conveyed paper

INVENTOR: IMADO, S; IWASAKI, R ; KOJIMA, T ; NAKAYASU, H

PATENT-ASSIGNEE: FUJITSU LTD (FUIT)

PRIORITY-DATA: 1998JP-0361680 (December 18, 1998)

Search Selected Search ALL Clear

PATENT-FAMILY:

	PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
☐	JP 3426148 B2	July 14, 2003		019	G03G015/01
☐	JP 2000181186 A	June 30, 2000		019	G03G015/01
☐	DE 19960067 A1	July 20, 2000		000	G03G015/01
☐	US 6219496 B1	April 17, 2001		000	G03G015/01

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
JP 3426148B2	December 18, 1998	1998JP-0361680	
JP 3426148B2		JP2000181186	Previous Publ.
JP2000181186A	December 18, 1998	1998JP-0361680	
DE 19960067A1	December 13, 1999	1999DE-1060067	
US 6219496B1	December 16, 1999	1999US-0464450	

INT-CL (IPC): G03 G 15/01; G03 G 15/16; G03 G 21/14

RELATED-ACC-NO: 2003-272516

ABSTRACTED-PUB-NO: JP2000181186A
BASIC-ABSTRACT:

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